Orbitoides (*Lepidocyclina*) *sumatrensis*, Brady.

Fig. 7. Exterior, × 9. (C.)
Fig. 8. Horizontal section above median plane, × 30. (C.)
Fig. 9. Chambers of median plane, × 60. (B. M.)
Fig. 10. Oblique section, × 35. (C.)
Fig. 11. Vertical section, × 16. (B. M.)
Fig. 12. Ditto, × 25. (B. M.)

Note.—The capital letters within brackets have the following signification:—

B. M. = British Museum collection.
M. = Professor Molengraaff's collection.
C. = Cambridge Museum of Zoology collection.

XLI.—*The Outcome of a South-Sea Voyage* *.

By L. A. Borradaile.

Dr. Arthur Willey was engaged on a voyage of research in the South Seas from 1895 to 1897. Since his return his valuable material has been in the hands of specialists, and the results of their labours are to be embodied in a work at present appearing in parts from the Cambridge University Press. The first two of these parts are now before us.

It is quite clear that, however valuable be the papers by other contributors, the explorer's own communications will form the prominent feature of the series.

This is amply evident in the first number, in which by far the most important article is the opening one by Dr. Willey on a new species and subgenus of *Peripatus* from New Britain. In accordance with the territorial nomenclature adopted for many species of the genus, the new form is to be called *Peripatus* (*Paraperipatus*) *novæ-britanniæ*. The male of this creature has 22 pairs of legs and the female, which is larger and more numerous, has 24. There are three spinous pads on each leg, and the generative opening is placed immediately behind the last pair. Receptacula seminis are present in the female, but there are no receptacula ovorum. The eggs are small and without yolk. The accessory glands of the male open to the exterior through a median bulbus immediately above the anus. The ductus ejaculatorius is median and short, and spermatophores are not formed.

* 'Zoological Results, based on material from New Britain, New Guinea, Loyalty Islands, and elsewhere, collected during the Years 1895, 1896, and 1897.' By Arthur Willey, D.Sc. Lond., Hon. M.A. Cantab., Balfour Student of the University of Cambridge. Parts I. and II. Cambridge: at the University Press. 1898.

Of the several interesting points arising in the course of the anatomical description the first occurs in the paragraphs on the female generative organs. The ovarial wall is thin and differs in structure from that of the oviduct, showing in this point a resemblance to the Cape and Australasian species and differing from the Neotropical. The eggs are follicular. Immediately on leaving the ovary the oviduct is of a structure different from that which it assumes during the rest of its length, and this first portion of the oviduct is called by Dr. Willey the "infundibulum," and likened to the funnel of a nephridium. The ovary itself is compared with the end-sac. Unfortunately there are no observations on the development of these organs.

The male generative organs, however, present features of even greater interest than the female. The vasa deferentia are symmetrical and pass to the exterior by a median ductus ejaculatorius which is hardly larger than the vagina of the female. This arrangement is precisely that supposed by Moseley to have been the original condition of the parts in question. The arrangement of the accessory glands is different from that presented by either of the other subgenera—in fact, each section of the genus has these organs in a condition quite different from that found in any of the others. Dr. Willey suggests that they are capable of throwing light on the Malpighian tubules of insects.

But the crowning peculiarity of the New-Britain *Peripatus* lies in the structure of its embryos. Of these a fairly complete series was available for examination, owing to the fact that each fertilized female contains a number of young of various ages. In the following short account of their development it will be best to use the author's own words where this is possible. In the early stages "the embryonic area proper is confined to a thickened tract at the posterior-ventral side of a large oval vesicle. The rest of the wall of the vesicle is composed of embryonic ectoderm and endoderm, which take no immediate part in the formation of the embryo. Physiologically it corresponds exactly with the peripheral epiblast and hypoblast of a mammalian blastodermic vesicle. As in the latter, it is the ectoderm which is chiefly concerned in the absorption of nutriment for the use of the embryo, as evidenced by the vacuolar character of the cells." In a later stage the vesicle comes to project behind as well as in front of the embryo.

By the appearance of a deepening transverse groove in the embryonic area the embryo proper becomes U-shaped. In the course of subsequent growth it becomes spirally coiled.

"The anterior region of the embryo is practically a punctum fixum, and the contortion of the embryo in a later stage is almost entirely due to the growth which is taking place at the primitive streak"—the latter being at the hind end.

The endoderm has a chequered history. In one of the earlier stages "many endoderm-cells forsake their epithelial position and become converted into wandering trophocytes." Subsequently the endoderm reconstitutes itself and forms "a fairly compact epithelial layer containing numerous eosinophile granules of varying sizes." Later on still this endoderm again breaks up. "In young individuals the brightly staining globules have entirely disappeared. The endoderm does not form an epithelial layer, but consists of cells lying loosely and freely in the gastral cavity, like the trophocytes in the embryo." A reconstitution of the endoderm after this second histolysis has not been observed. It is suggested that histolysis of the endoderm is a periodically recurring phenomenon in *Peripatus*.

As to the general bearings of this history, the resemblance of the embryo in the earlier stages to that of an insect before the infolding, and of the trophic vesicle, "when the embryo is flexed and the trophic organ covers its ventral surface as with a cap," to the amnion of an insect is duly pointed out in the present paper, and has since been the subject of an article in the 'Quarterly Journal of Microscopical Science.' But there is another resemblance, even more interesting if less obvious than that just referred to, on which Dr. Willey is at present silent.

The discovery of a new method of development in *Peripatus* naturally suggests speculation as to whether the embryo is in any way comparable with the trochosphere larva of Annelids. Now the embryo in question is a vesicular creature, with a greatly swollen preoral region, a ventral mouth-site, and two ventro-lateral bands of mesoderm (hindward these two bands become one), starting at the hind end in the neighbourhood of the future anus, and thence proliferating. The adult form is reached by the elongation of the hinder part of the body concurrently with the formation of new segments at the hind end and the reduction of the antero-dorsal vesicular region. In all these points our embryo resembles a trochosphere. The absence of the ciliated rings would, of course, be expected in view of the loss of the free life. No serious difficulty is presented by the absence of a blastocœl, this condition being already known in various Polychætes (*Psygmobranchus* &c.) and in the Earthworms. The embryos of the latter group, under the influence of altered conditions of nutrition, show a

curious analogy with that of our *Peripatus*, although the nutritive conditions in the present case have been altered in a somewhat different direction, and the ectoderm is required to be absorptive, and not merely retaining as in the earthworms. Indeed, it seems scarcely extravagant to hope that renewed investigation may reveal traces of some structure comparable to the trochosphere head-kidney. Further details will in any case be awaited with interest.

So much for the resemblance of the new *Peripatus* embryo to the trochosphere. It must at the same time be confessed that the presence of a primitive streak points to the probability that the original free larva of *Peripatus*, postulated by Kennel and Willey, was not in all respects a typical trochosphere. But it seems not unlikely that this very feature may lead to the most valuable results when the whole question is fully discussed.

The other articles in Part I. are:—one by Dr. Paul Mayer on a new Caprellid, to which he has given the name of *Metaprotella sandalensis*, and which is interesting on account of its habitat, Caprellids being rare in the tropics; one by Mr. G. A. Boulenger on the rare sea-snake *Aipysurus annulatus* (Krefft); two by Mr. R. I. Pocock on the Arachnids and Myriapods respectively; and one by Dr. David Sharp on the Phasmidæ, with notes on the eggs. The introduction to the latter article contains some very interesting remarks on the eggs of Phasmidæ and other subjects relating to the same family.

With the exception of a valuable little paper by Mr. J. Stanley Gardiner on the postembryonic development of the Fungid coral *Cycloseris*, which he finds to closely resemble that of *Fungia*, the whole of the second part is given up to systematic accounts of the collections of various groups of animals. It includes a paper on the Milleporidæ by Professor Hickson, containing some interesting remarks on retractile nematocysts in that group; and reports on the Holothurians by Mr. F. P. Bedford, on the other Echinoderms by Prof. Jeffrey Bell, on Sipunculids by Mr. A. E. Shipley, on Solitary Corals by Mr. J. Stanley Gardiner, on Earthworms by Mr. F. E. Beddard, and on Gorgonacea by Miss I. L. Hiles.

For the rest, the style in which this publication is produced is above praise. The type is large and clear, and set in fair wide margins; the plates are excellent, and accompanied, where this is needed, by full and clear explanations. A good setting for good work.